

ATTACHMENT 2

§ 25.257 Special requirements for operations in the band 29.1- 29.25 GHz

(a) Special requirements for operations in the band 29.1-29.25 GHz.

(1) **A maximum of two non** Non-geostationary mobile satellite service (non-GSO MSS) operators shall **be licensed to** use the 29.1-29.25 GHz band for Earth-to-space transmissions from feeder link earth station complexes. For purposes of this subsection, a "feeder link earth station complex" may include up to three (3) earth station groups, with each earth station group having up to four (4) antennas, located within a radius of 75 nautical miles of a given set of geographic coordinates provided by a non-GSO MSS operator pursuant to ~~subsections (e)(5) or (e)(6)(i)~~ **section 21.1002.**

(2) A maximum of eight (8) feeder link earth station complexes in the contiguous United States, Alaska, and Hawaii may be ~~operated concurrently~~ **placed into operation** in the band 29.1-29.25 GHz.

(3) One of the non-GSO MSS operators licensed to use the 29.1-29.25 GHz band may specify geographic coordinates for a maximum of eight feeder link earth station complexes that transmit in the 29.1-29.25 GHz band. A maximum of six of these feeder link earth station complexes may be placed into operation. The other non-GSO MSS operator licensed to use the 29.1-29.25 GHz band may specify geographic coordinates for a maximum of two feeder link earth station complexes that transmit in the 29.1-29.25 GHz band. Both of these feeder link earth station complexes may be placed into operation. The selection of the feeder link earth station complex locations shall be made in accordance with section 21.1002.

(4) Both non-GSO MSS operators shall cooperate fully and make reasonable efforts to identify mutually acceptable locations for feeder link earth station complexes. In this connection, any single non-GSO MSS operator shall only identify one feeder link earth station complex protection zone in each category identified in section 21.1002(c)(2) until the other non-GSO MSS operator has been given an opportunity to select a location from that same category.

~~(b) Coordination of LMDS systems and geostationary fixed satellite systems in the band 29.1-29.25 must be done in accordance with the technical standards of §§ 21.1018-21.1024.~~

§ 21.1002 Frequencies

(c) Special requirements for operations in the band 29.1-29.25 GHz

(1)(i) LMDS receive stations operating on frequencies in the 29.1-29.25 GHz band within a radius of 75 nautical miles of the geographic coordinates provided by a non-GSO MSS licensee pursuant to subsections (c)(2) or (c)(3)(i) (the "feeder link earth station complex protection zone") shall accept any interference caused to them by such earth station complexes and shall not claim protection from such earth station complexes.

(ii) LMDS licensees operating on frequencies in the 29.1-29.25 GHz band outside a feeder link earth station complex protection zone shall cooperate fully and make reasonable efforts to resolve technical problems with the non-GSO MSS licensee to the extent that transmissions from the non-GSO MSS operator's feeder link earth station complex interfere with an LMDS receive station.

(2) ~~At least 45 days prior to~~ **No more than 15 days after the release of a public notice announcing** the commencement of LMDS auctions, feeder link earth station complexes **to be licensed pursuant to Section 25.257** shall be specified by a set of geographic coordinates in accordance with the following requirements: no feeder link earth station complex may be located in the top eight (8) metropolitan statistical areas ("MSAs"), ranked by population, as defined by the Office of Management and Budget as of June 1993, using estimated populations as of December 1992; two (2) complexes may be located in MSAs 9 through 25, one of which must be Phoenix, AZ (for a complex at Chandler, AZ); ~~one (1) complex~~ **two (2) complexes** may be located in MSAs 26 to 50; ~~three (3)~~ **two (2)** complexes may be located in MSAs 51 to 100, one of which must be Honolulu, Hawaii (for a complex at Waimea); and the ~~two (2)~~ **four (4)** remaining complexes must be located at least 75 nautical miles from the borders of the 100 largest MSAs or in any MSA not included in the 100 largest MSAs. Any location allotted for one range of MSAs may be taken from an MSA below that range.

(3)(i) Any non-GSO MSS licensee may at any time specify sets of geographic coordinates for feeder link earth station complexes with each earth station contained therein to be located at least 75 nautical miles from the borders of the 100 largest MSAs.

(ii) For purposes of subsection (c)(3)(i), non-GSO MSS feeder link earth station complexes shall be entitled to accommodation only if the affected non-GSO MSS licensee reapplies to the Commission for a feeder link earth station complex or certifies to the Commission within sixty days of receiving a copy of an LMDS application that it intends to file an application for a feeder link earth station complex within six months of the date of receipt of the LMDS application.

(iii) If said non-GSO MSS licensee application is filed later than six months after certification to the Commission, the LMDS and non-GSO MSS entities shall still cooperate fully and make reasonable efforts to resolve technical problems, but the LMDS licensee shall not be obligated to re-engineer its proposal or make changes to its system.

(4) LMDS licensees or applicants proposing to operate hub stations on frequencies in the 29.1-29.25 GHz band at locations outside of the 100 largest MSAs or within a distance of 150 nautical miles from a set of geographic coordinates specified under subsection (c)(2) or (c)(3)(i) shall serve copies of their applications on all non-GSO MSS applicants, permittees or licensees meeting the criteria specified in § 25.257(a). Non-GSO MSS licensees or applicants shall serve copies of their feeder link earth station applications on any LMDS applicant or licensee within a distance of 150 nautical miles from the geographic coordinates that it specified under subsection (c)(2) or (c)(3)(i). Any necessary coordination shall commence upon notification by the party receiving an application to the party who filed the application. The results of any such coordination shall be reported to the Commission within sixty days. The non-GSO MSS earth station licensee shall also provide all such LMDS licensees with a copy of its channel plan.

ATTACHMENT 3

§ 25.XXX Special requirements for operations in the 29.25-29.5 GHz band.

(a) Any earth station in the geostationary fixed-satellite service that is operating on frequencies in the 29.25-29.5 GHz band within a protection zone, the size of which shall be determined through intersystem coordination, around the geographic coordinates of a non-geostationary mobile satellite service feeder link earth station complex operating on frequencies in the 29.25-29.5 GHz band shall not transmit using left-hand circular polarization in the 29.25-29.5 GHz band during any time it is in line within $\pm 1.5^\circ$ of any of the non-geostationary mobile satellites of the non-geostationary mobile satellite system associated with said feeder link earth station complex.

(b) The operator of non-geostationary mobile satellite service feeder link earth stations licensed to transmit Earth-to-space in the 29.25-29.5 GHz band shall employ one or more of the following measures, as reasonable and necessary, to protect geostationary fixed-satellite service satellite receivers operating in the 29.25-29.5 GHz band from harmful interference:

- (1) siting its feeder link earth station complexes so as to minimize the number of intersections with geostationary fixed-satellite service satellites in the frequency band 29.25-29.5 GHz;
- (2) reducing the power levels of its non-geostationary mobile satellite service feeder link earth station transmitters so that the signal received at the geostationary fixed-satellite service satellite is within acceptable levels; or
- (3) switching non-geostationary mobile satellite service traffic to one or more alternate earth stations whenever a feeder link earth station complex is in line within $\pm 0.5^\circ$ of a geostationary fixed-satellite service satellite.

(c) In order to reduce or minimize the likelihood that satellites in the geostationary arc would receive harmful interference from a non-geostationary mobile satellite service system's earth stations operating in the 29.25-29.5 GHz band, the operator of a non-geostationary mobile satellite service system that has not yet launched satellites shall, as reasonable and necessary, consider adjusting the phasing of its system's orbital constellation, and coordinating with geostationary fixed-satellite service operators as to the placement of their spacecraft.

ATTACHMENT 4

Co-Directional Frequency Sharing Between NGSO MEO MSS Feederlinks and GSO Satellite System Service in the 28 GHz Band

1.0 Introduction

This paper presents analysis and simulation results related to the feasibility of co-directional frequency sharing between non-geostationary mobile satellite service ("NGSO MSS") feederlinks and a geostationary fixed satellite service ("GSO FSS") system in the 29.250 to 29.5 GHz band ("28 GHz band"). Interference between NGSO MSS feederlinks and GSO service links is examined because GSO FSS service links receive more interference than GSO FSS feederlinks since the service link user is assumed to be using a very small aperture terminal (VSAT), which produces much wider antenna beamwidths.

The Odyssey system is used as an example of a NGSO MSS system with the feederlink operating in 28 GHz band. The proposed "Spaceway" system of Hughes Communications Galaxy, Inc. is used as an example of a GSO FSS system with service links operating in 28 GHz band. The analysis and simulation of these systems and their "in-line" interference events provide valuable information to demonstrate the feasibility of co-directional frequency sharing between these types of systems at 28 GHz band.

All technical parameters presented in this paper are from the FCC filings of the respective systems.

2.0 Technical Characteristics of Satellite Systems

The Odyssey system constellation comprises twelve satellites in three orbital planes at an inclination of 50 degrees to the equatorial plane. The Odyssey system uses the L-band 1610 to 1626.5 MHz for the mobile return link from the user to the satellite. The mobile forward link from the satellite to user uses the S-band 2483.5 to 2500.0 MHz.

In November 1994, TRW requested the 19.8 to 20.1 and 29.7 to 30.0 GHz bands for the feeder return link from the satellite to the earth station and the feeder forward link from the earth station to the satellite, respectively. These frequency bands are currently allocated for FSS. However, because the United States proposals for WRC '95 do not contemplate NGSO MSS feeder link operations in the bands selected by TRW, TRW expects shortly to modify its authorization to specify the 19.4 to 19.7 GHz and 29.2 to 29.5 GHz bands for the feeder return link and feeder forward link, respectively.

The satellite payload functions as a simple bent pipe, frequency translating transponder. For the mobile link, each satellite has the multi beam antenna

with 40° field-of-coverage. In the feeder link, each satellite has three independent steerable antennas with spot beams for both transmitting and receiving signals to/from multiple gateway. The 3 dB beamwidth of the transmit and receive antenna are 3° and 2.2°, respectively.

The proposed Spaceway system would consist of 17 satellites in six geostationary orbital locations. Two satellites would be located at each of 101° West longitude and 99° West longitude to serve North America. Four satellites would be located at 110° East longitude to serve Asia-Pacific. Another four satellites would be located at 50° West longitude to serve Central/South America; and Europe/Africa would be served by four satellites located at 25° East longitude. In addition, a single satellite would be located at 175° East longitude to provide single-hop service between eastern Asia and the United States. At 99° W.L. and 101° W.L., the Spaceway system would use the 19.2 to 20.2 GHz bands. At its other locations, the Spaceway system would use the band 17.7 to 20.2 GHz for space-to-ground transmission, and the 27.5 to 30.0 GHz band for ground-to-space transmission.

The orbital characteristics of the Odyssey system and Spaceway system are given in Table 2-1.

Table 2-2 shows the satellite communication system parameters.

Table 2-3 shows the earth station/user communication system parameters.

The service link frequency and polarization plans for each of the 17 satellites in the Spaceway system are summarized in Table 2-4.

Table 2-1: Orbital Parameters

Parameters	Odyssey (NGSO MSS)	Spaceway (GSO)
Number of satellites	12	17
Number of orbital planes	3	1
Altitude	10355 Km	35787 Km
Inclination angle	50°	0°
Orbit	Circular	Circular
Period of orbit	5.98 hours Or 5 hours and 59 minutes	23.94 hours Or 23 hours and 56.4 minutes
Satellites location	-	2 satellites @ 101° W.L. 2 satellites @ 99° W.L. 4 satellites @ 110° E.L. 4 satellites @ 50° W.L. 4 satellites @ 25° E.L. 1 satellite @ 175° E.L.

Table 2-2: Satellite Communication System Parameters

Satellite Parameters	Odyssey (NGSO MSS) (Feederlinks)	Spaceway (GSO) (Service link/user)
Receive frequency range	29.2 to 29.5 GHz	27.5 to 30.0 GHz*
Receive bandwidth (Total)	300.0 MHz	1000 - 2500 MHz
Beam bandwidth	300.0 MHz	120.0 MHz
Receive Polarization	LHCP	LHCP & RHCP
Receive antenna gain (Peak)	38.5 dBi	46.5 dBi - narrow spot beam 35.0 dBi - wide spot beam
3 dB beamwidth	2.2°	Narrow spot beam: 0.87° Wide spot beam: 3.2°
Receive channel bandwidth	2.5 MHz	500.0 KHz
Receive total system noise Temperature	780 ° K or 28.9 dB-K	575 ° K or 27.6 dB-K
Transmit frequency range	19.4 to 19.7 GHz	17.7 to 20.2 GHz**
Transmit bandwidth	300.0 MHz	1000 - 2500 MHz
Transmit Polarization	RHCP	LHCP & RHCP
Transmit AEIRP (Peak) Transmit signal AEIRP	46.4 dBW ~37.0 dBW	59.01 dBW - narrow spot beam 52.3 dBW - wide spot beam
Transmit antenna gain	35.7 dBi	46.5 dBi - narrow spot beam 35.02 dBi - wide spot beam
3 dB beamwidth	3.0°	Narrow spot beam: 0.87° Wide spot beam: 3.14°
Transmit channel bandwidth	2.5 MHz	120.0 MHz
Transmit power density into antenna	-65 dBW/Hz (peak)	-67.13 dBW/Hz - narrow beam - 62.36 dBW/Hz - wide beam

* 29.0 to 30.0 GHz at 99° W.L. and 101° W.L.

** 19.2 to 20.2 GHz at 99° W.L. and 101° W.L.

Table 2-3: Earth Station/User Communication System Parameters

Earth Station/ User Parameters	Odyssey (NGSO MSS) (Feederlinks)	Spaceway (GSO) (Service link/user)
Transmit frequency range	29.2 to 29.5 GHz	27.5 to 30.0 GHz*
Transmit bandwidth	300.0 MHz	1000-2500.0 MHz - Total BW 500.0 MHz/Front end Receiver
Transmit Polarization	LHCP	LHCP & RHCP
Transmit EIRP	85.9 dBW	40.9 to 56.6 dBW Depend on antenna size
Transmit antenna gain	64.8 dBi	44.5 to 54.1 dBi Depend on antenna size
3 dB Beamwidth	0.11°	0.36° to 1.09° Depend on E/S Tx EIRP
Transmit channel bandwidth	2.5 MHz	500 KHz, 998.4 KHz or 2.0 MHz Depend on E/S Tx EIRP
Transmit power density into antenna	-55.49 dBW/Hz (peak)	-59.4 to -53.0 dB/Hz depend on the data rate/ ant.
Receive frequency range	19.4 to 19.7 GHz	17.7 to 20.2** GHz
Receive bandwidth	300.0 MHz	1000 to 2500.0 MHz - Total BW 500.0 MHz/Front end Receiver
Receive Polarization	RHCP	RHCP & LHCP
Receive antenna gain	60.8 dBi	40.83 dBi to 50.4 dBi Depend on antenna size
3 dB Beamwidth	0.17°	0.55° to 1.67° Depend on antenna size
Receive antenna noise temperature	666.5 ° K or 28.2 dB-K	275 ° K or 24.4 dB-K

* 29.0-30.0 Hz at 99° W.L. and 101° W.L.

** 19.2-20.2 GHz at 99° W.L. and 101° W.L.

Table 2-4: Spaceway Service Link Frequency and Polarization Plans

Satellite #	Orbital Location	Uplink Freq. (GHz)	Downlink Freq. (GHz)	Polarization U/L & D/L	Coverage
Sat #1	101° W.L	29.5 to 30.0	19.7 to 20.2	LHCP & RHCP	North America
Sat #2	101° W.L	29.0 to 29.5	19.2 to 19.7	LHCP & RHCP	North America
Sat #3	99° W.L	29.5 to 30.0	19.7 to 20.2	LHCP & RHCP	North America
Sat #4	99° W.L	29.0 to 29.5	19.2 to 19.7	LHCP & RHCP	North America
Sat #5	50° W.L	29.5 to 30.0	19.7 to 20.2	LHCP & RHCP	Central/ S. America
Sat #6	50° W.L	29.0 to 29.5	19.2 to 19.7	LHCP & RHCP	Central/ S. America
Sat #7	50° W.L	27.5 to 28.0	17.7 to 18.2	LHCP & RHCP	Central/ S. America
		28.5 to 29.0	18.7 to 19.2	LHCP & RHCP	
Sat #8	50° W.L	27.5 to 28.5	17.7 to 18.7	LHCP & RHCP	Central/ S. America
Sat #9	25° E.L	29.5 to 30.0	19.7 to 20.2	LHCP & RHCP	Europe/Africa
Sat #10	25° E.L	29.0 to 29.5	19.2 to 19.7	LHCP & RHCP	Europe/Africa
Sat #11	25° E.L	27.5 to 28.0	17.7 to 18.2	LHCP & RHCP	Europe/Africa
		28.5 to 29.0	18.7 to 19.2	LHCP & RHCP	
Sat #12	25° E.L	28.0 to 28.5	17.7 to 18.7	LHCP & RHCP	Europe/Africa
Sat #13	110° E.L	29.5 to 30.0	19.7 to 20.2	LHCP & RHCP	Asia-Pacific
Sat #14	110° E.L	29.0 to 29.5	19.2 to 19.7	LHCP & RHCP	Asia-Pacific
Sat #15	110° E.L	27.5 to 28.0	17.7 to 18.2	LHCP & RHCP	Asia-Pacific
		28.5 to 29.0	18.7 to 19.2	LHCP & RHCP	
Sat #16	110° E.L	27.5 to 28.5	17.7 to 18.7	LHCP & RHCP	Asia-Pacific
Sat #17	175° E.L	29.5 to 30.0	19.7 to 20.2	LHCP & RHCP	Pacific Interconnect

2.1 The Odyssey and the Spaceway Antenna Patterns

2.1.1 Earth Station Antenna Patterns

The Odyssey earth station transmit antenna pattern is shown in Figure 2-1.

Figures 2-2 shows the 0.66 m transmit antenna pattern of the Spaceway user.

2.1.2 Satellite Antenna Patterns

Figure 2-3 shows the Odyssey receive satellite antenna pattern.

The Spaceway narrow spot beam receive satellite antenna pattern is shown in Figure 2-4.

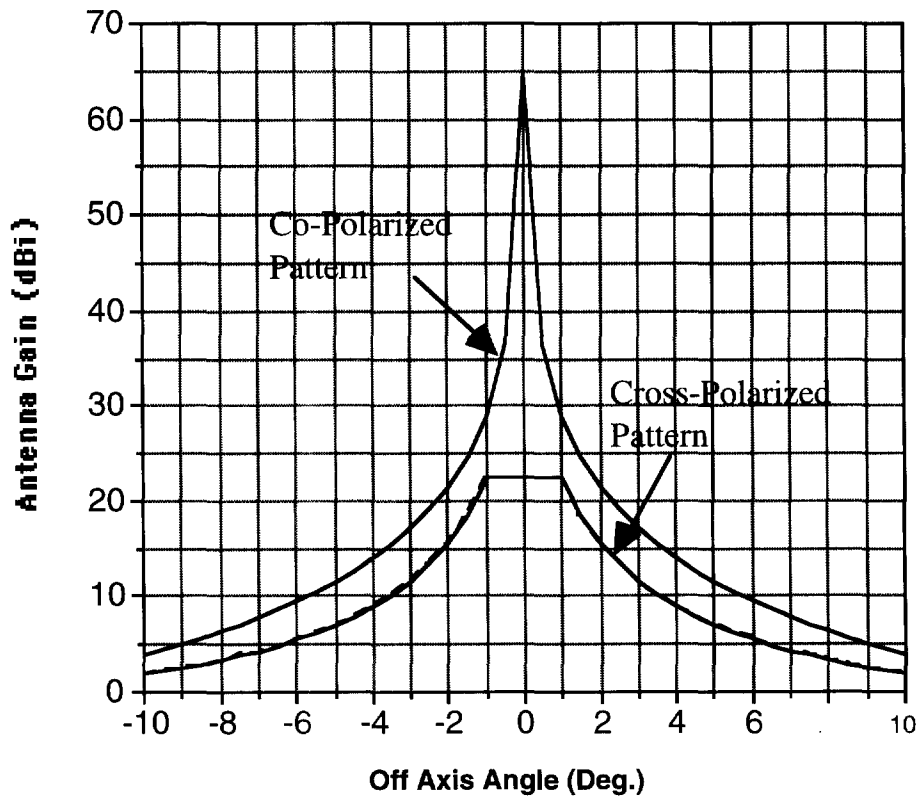


Figure 2-1: The Odyssey E/S Transmit Co & Cross-Polarized Antenna Patterns

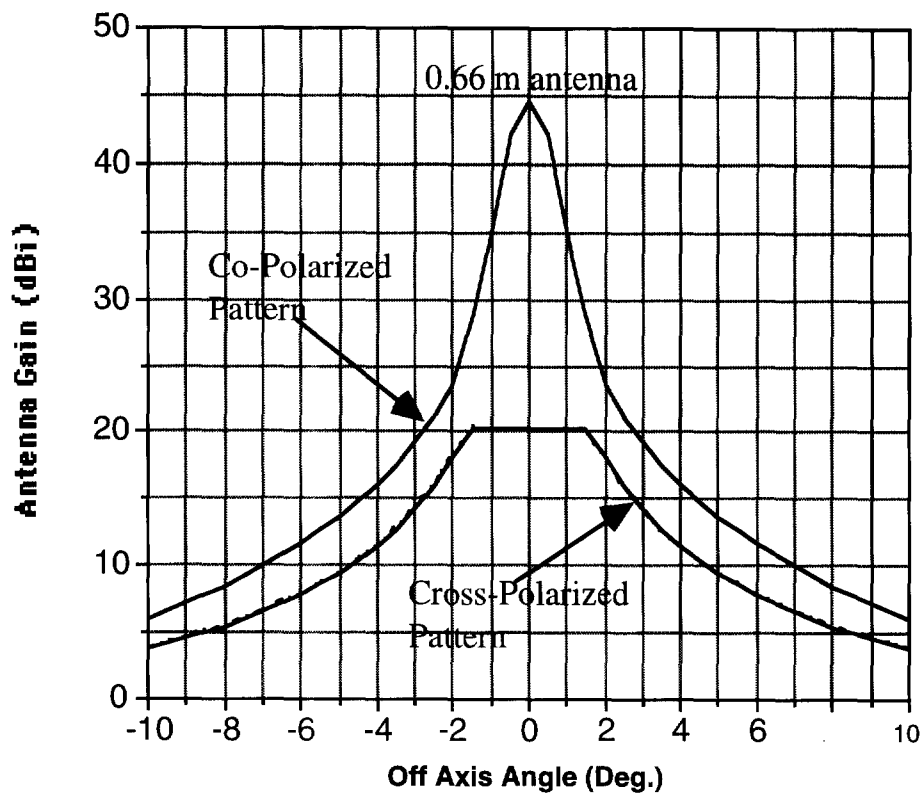


Figure 2-2: The Spaceway User 0.66 m Transmit Co & Cross-Polarized Ant. Patterns

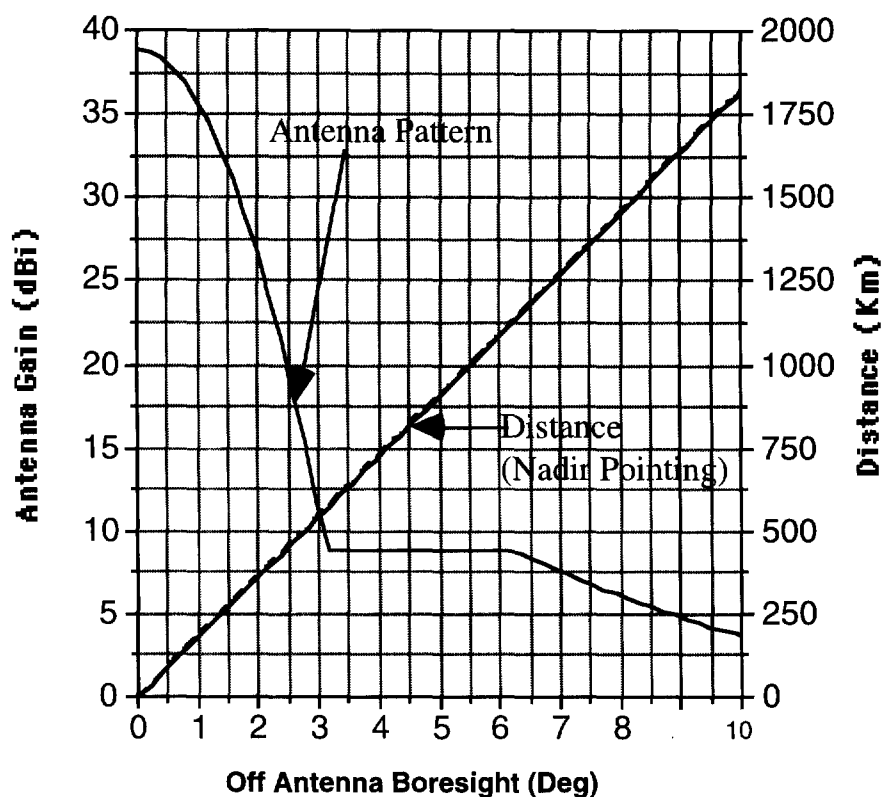


Figure 2-3: The Odyssey Receive Satellite Antenna Patterns (CCIR Rec. 558-4)

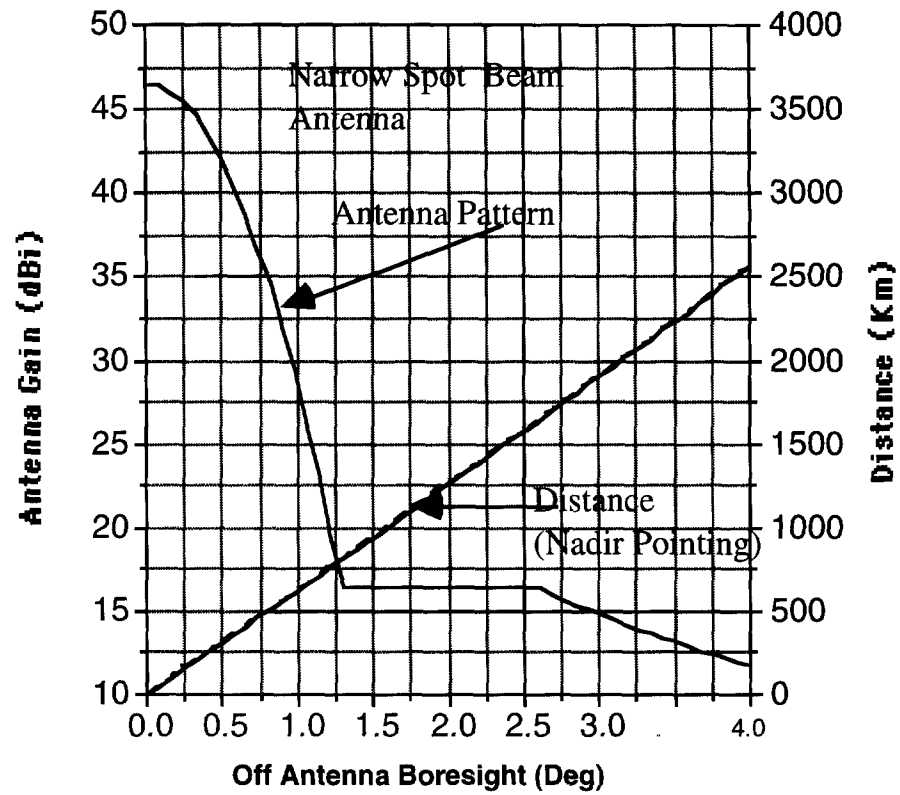


Figure 2-4: The Spaceway Narrow Spot Beam Transmit & Receive Satellite Antenna Patterns (CCIR Rec. 558-4)

3.0 Interference Analysis

Non-geostationary satellites are in continuous motion with respect to geostationary satellites. Short duration "in-line" interference events will occur for both NGSO and GSO networks when the NGSO satellite passes through the main beam of the GSO satellite.

Interference analysis for the worst case, single-entry "in-line" interference events of the Odyssey (NGSO MEO MSS) satellite feederlinks and the Spaceway (GSO) satellite service link in the 28 GHz band was performed. Two possible interference cases were considered:

- * The Odyssey (NGSO MEO MSS) feederlink transmit earth station interfering with the Spaceway (GSO FSS) satellite receiver
- * The Spaceway service link transmit earth station interfering with the Odyssey satellite receiver

In each case, the calculated interference level is based on the following assumptions:

- * The Odyssey system and the Spaceway operate in:
 - ** Same polarization or
 - ** Opposite polarization
- * Eight potential earth station locations for the Odyssey system, specified for purposes of illustration only, were used in the calculation. The potential earth stations are:
 - ** San Luis Obispo, Ca - USA
 - ** Portland, Maine - USA
 - ** Buenos Aires, Argentina
 - ** Capetown, South Africa
 - ** Ahmadabad, India
 - ** Marseille, France
 - ** Yamaguchi, Japan
 - ** Sydney, Australia

Due to the intermittent nature of "in-line" interference, results are expressed in terms of short term allowances. Criteria for acceptable interference based on an allowable interference-to-noise ratio (I/N_T) for a given percentage of time was presented in the CPM Report CPM 95/118, at 43 (Table 8A), April 1995. Based on the CPM Report, the interference due to NGSO MSS feeder link

at the input to the demodulator receiving a digital carrier in the GSO/FSS network should not exceed any the following values:

Interference	Maximum % Time Exceeded (For 30/20 GHz Network)
Negligible ($\leq 6\%$)	0.87
$0.78 N_T$	0.119
$2.98 N_T$	0.0294
$14.8 N_T$	0.0004

This criteria for acceptable interference is also used for the case of 28 GHz GSO FSS system to compute the statistic for the interference to NGSO MSS feederlinks.

Figure 3.1 illustrates the potential interference of two satellite networks, namely the Odyssey system and the Spaceway system. The receive satellite antenna of the Odyssey (or Spaceway) receives interference from some of the transmit signal power generated by the transmit earth station of the Spaceway service link (or Odyssey feederlinks).

The calculated uplink interference was based on the following:

- * All earth station transmit antennas meet the CCIR Recommendation 580
- * The estimated satellite antenna patterns were based on the CCIR Recommendation 558-4
- * The earth station transmit antenna cross polarized patterns were based on CCIR Recommendation 731

The Odyssey system uses part of 28 GHz band, 29.2 to 29.5 GHz, for the feeder forward link from earth station to satellite. Therefore, this paper only presents the potential interference between the Odyssey system and the Spaceway satellites #2 (101° W.L), and 4 (99° W.L), that would operate in the same frequency band as the Odyssey feederlink.

The close spacing of the Odyssey system ground traces make it unlikely that the Odyssey constellation could be oriented to completely avoid interference with the geostationary orbit. Figure 3-2 shows the 12 satellites in 24 hours of repeating ground traces for the Odyssey system. The triangles indicate the positions of the satellites at one time point.

Figure 3-3 shows the maximum interference duration vs. off axis angle from the Odyssey earth station in which the Spaceway system would receive interference from the Odyssey system. It is important to note that the maximum interference duration is approximately 3.5 minutes and in most cases would be substantially less than 2 minutes. Specifically, for 0.2° or less, the interference duration is less than 15 seconds.

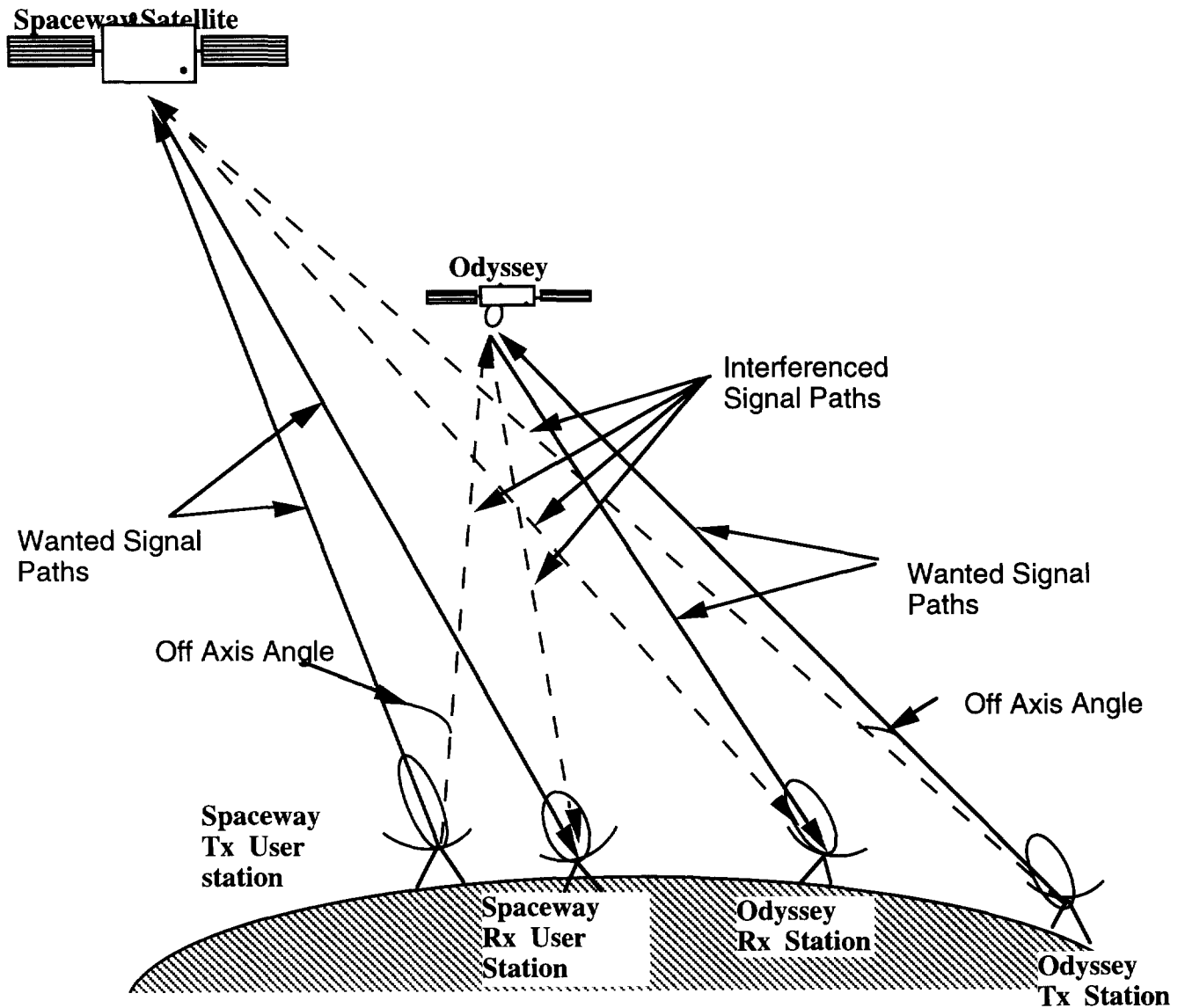


Figure 3.1: Interference Geometry Between The Odyssey and The Spaceway Networks

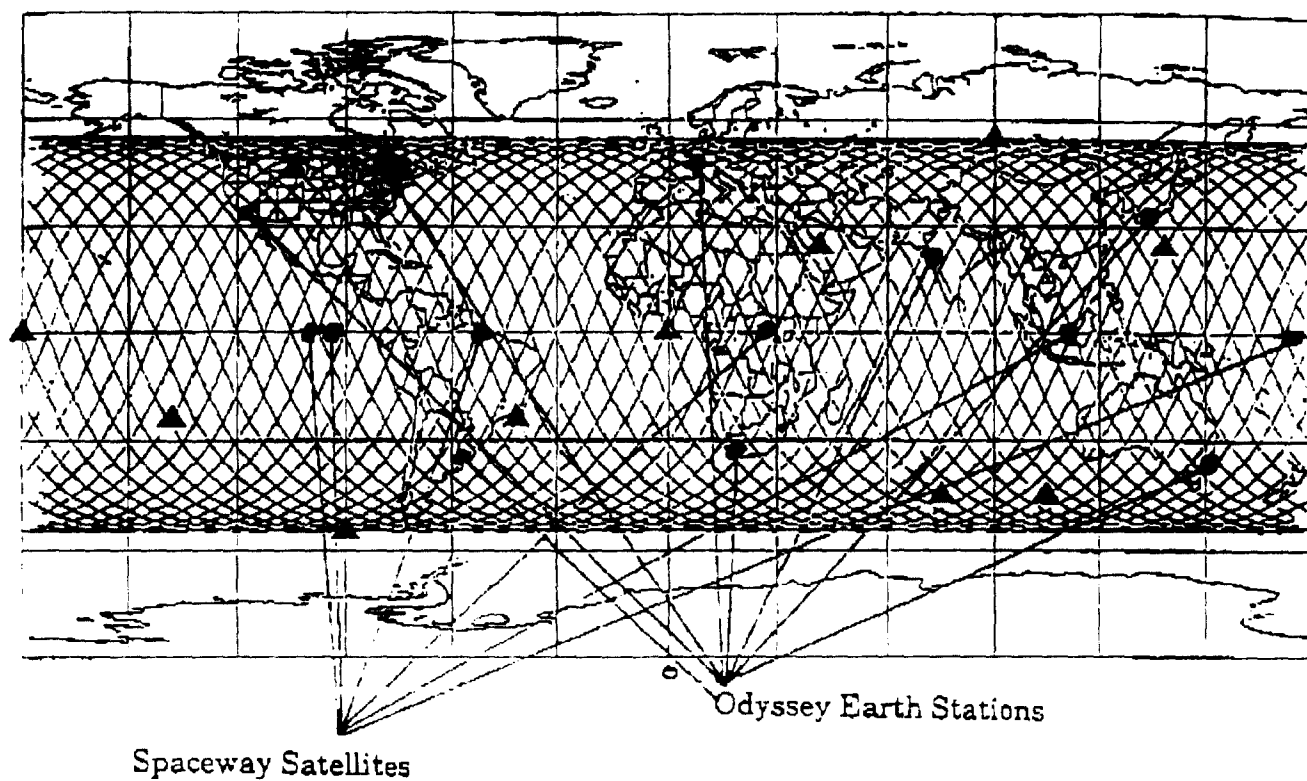


Figure 3-2: Odyssey Ground Trace (12 Satellites, 24 Hour Repeating Ground Traces)

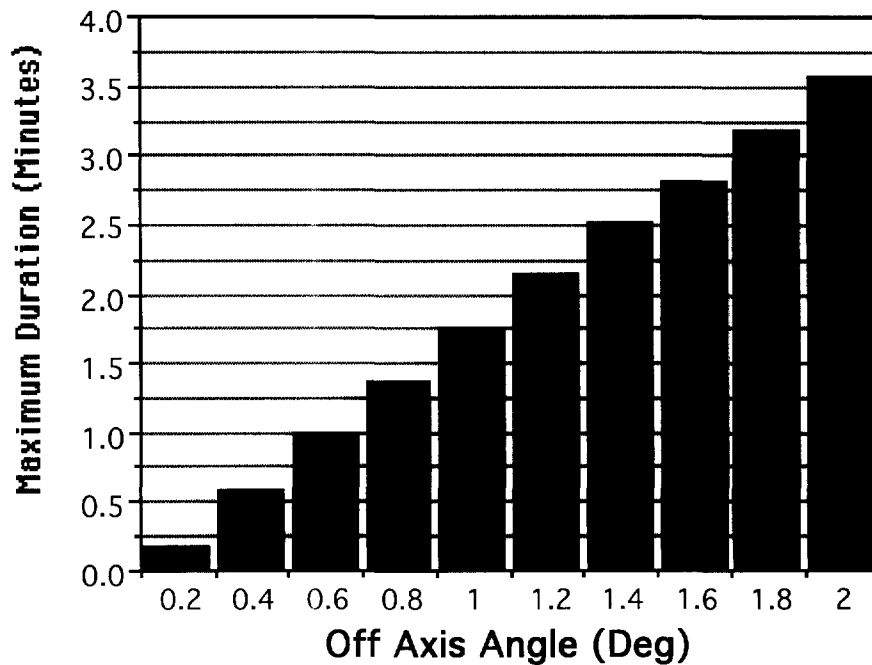


Figure 3-3: Maximum "in-line" Interference Duration vs. Off Axis Angle

3.1 Uplink Interference

Under the FCC proposals for the 19 GHz band allocations, the allocated downlink frequency for the NGSO MSS feeder link and GSO FSS would be different. Therefore, this paper only presents the potential uplink interference between the Odyssey feeder link and the Spaceway service link.

Table 3-1 summarizes the potential interference between Odyssey earth stations and the Spaceway satellites. The data presented here, for global comparison, is for informational purposes. The analysis that follows addresses the interference results for USA earth stations.

Table 3-1

Odyssey Earth Station	Odyssey Sat. #	Spaceway Satellite #	GEO Location	Appear within X° off axis angle from Odyssey E	Odyssey Alternate E/S/S
Buenos-Aires	Satellite #6	Satellite #2	99° W.L	0.4 deg.	San Luis Obispo
Portland, ME	Satellite #7	Satellite #4	101° W.L	1.4 deg.	Buenos Aires
Portland, ME	Satellite #12	Satellite #6	50° W.L	0.4 deg.	Buenos Aires
Marseille	Satellite #2	Satellite #6	50° W.L	0.6 deg.	Buenos Aires
Capetown	Satellite #1	Satellite #6	50° W.L	0.8 deg.	Buenos Aires
San Luis Obispo	Satellite #4	Satellite #6	50° W.L	1.4 deg.	Buenos Aires
Ahmadabad	Satellite #5	Satellite #10	25° E.L	0.4 deg.	Marseille
Marseille	Satellite #3	Satellite #10	25° E.L	0.6 deg.	Capetown
Capetown	Satellite #9	Satellite #10	25° E.L	1.0 deg.	Marseille
Sydney	Satellite #10	Satellite #14	110° E.L	0.4 deg.	Ahmadabad
Ahmadabad	Satellite #2	Satellite #14	110° E.L	1.0 deg.	Yamaguchi

Table 3-1 can be read as:

* The Odyssey satellite #6 causes "in-line" interference when the Spaceway satellite #2 (101° W.L) appears within 0.4° off axis angle from the Odyssey earth station at Buenos-Aires. However, if this earth station causes "in-line" interference to Spaceway satellite #2, then the Odyssey system has an option to use an alternate earth station at San Luis Obispo

Based on our analysis, we make the following conclusions:

* Interference with Spaceway satellites located at 99° W.L: the Odyssey system would not interfere with Spaceway satellites located at 99° W.L, because the Odyssey earth station at Buenos Aires isn't in the coverage antenna pattern of the Spaceway satellite #2 located at 99°W.L.

* Interference with Spaceway satellites located at 101° W.L: the Odyssey earth station at Portland (Maine) may cause "in-line" interference with Spaceway satellite #4 appear within 1.4° off axis angle, because, the Odyssey earth station at Portland would be in the coverage antenna pattern of Spaceway satellite #4 located at 101° W.L.

3.1.1 Potential Interference At The Spaceway Satellites

With the Odyssey earth station at San Luis Obispo, no interference would be caused to Spaceway satellites at 99° W.L. or 101° W.L. since the ground station tracking does not cross the geostationary arc at or near these locations. See Figure 3-4. The ground station for the Odyssey earth station at Portland, ME would cross the geostationary arc at 101° W.L. See Figure 3-5. The interference level at the Spaceway satellites at 101° W.L. is summarized in Table 3-2. Figure 3-5 shows the Odyssey earth station at Portland.

Table 3-2: Interference Level At the Spaceway Satellites

Criteria		Calculated InterferenceLevel	
Time Percentage	Interference Level	Same polarization /Odyssey	Opposite polarization/Odyssey
		Satellite # 2 101° W.L.	Satellite # 2 101° W.L.
0.87%	$I=0.06N_T$	--	--
0.119%	$I=0.78N_T$	$I=1.74N_T$	$I=0.43N_T$
0.0294%	$I=2.98N_T$	$I=2.43N_T$	$I=0.59N_T$
0.0004%	$I=14.8N_T$	$I=2.43N_T$	$I=0.59N_T$

In order to meet the recommended interference level (CPM 95/118-E), the level of interference at the Spaceway satellites must be reduced by the amount shown in Table 3-3

Table 3-3: Required Interference Reduction

Time Percentage	Interference Level	Same polarization /Odyssey	Opposite polarization/Odyssey
		Satellite # 2 101° W.L.	Satellite # 2 101° W.L.
0.87%	$I=0.06N_T$	- -	- -
0.119%	$I=0.78N_T$	$I=3.49N_T$	- -
0.0294%	$I=2.98N_T$	- -	- -
0.0004%	$I=14.8N_T$	- -	- -

From Table 3-3, we can make the following conclusions

- * The interference level at the Spaceway satellite is 2.3 dB higher than the recommended level (worst case) if Odyssey and Spaceway were to operate on the same polarization.
- * The interference level at Spaceway satellite # 2 would not be exceeded if Odyssey and Spaceway were to operate opposite polarization.

For the co-polarization case, if the transmit power density for Odyssey that is reflected in Table 3-3 were to be reduced by 6 dB during periods of in-line interference, then the interference received at the Spaceway satellite would be reduced below the recommended level. See Table 3-4.